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Guns versus Growth: Assessing the Validity of the Benoit Hypothesis on the Egyptian Economy

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ABSTRACT

In the early 1970s, Emile Benoit introduced the concept of positive correlations between military expenditure rates and economic growth rates in less developed countries (LDCs), igniting interest among development economists. This study evaluates the Benoit hypothesis in the context of the Egyptian economy from 1971 to 2022. Using the Autoregressive Distributed Lag (ARDL) model and the Toda-Yamamoto causality test, we examine the complex dynamics of the military spending and economic growth relationship in Egypt. Our findings challenge conventional expectations, revealing intricate short-term and long-term economic interactions. The Toda-Yamamoto test indicates a one-way causal relationship from economic growth to military spending, highlighting economic prosperity's influence on defense budgets. However, the absence of a clear reciprocal causal link underscores the relationship's complexity, influenced by factors like resource allocation and temporal lags in the economic impact of military expenditures.

Keywords: Military Expenditure, Economic Growth, Benoit Hypothesis, Autoregressive Distributed Lag, Toda-Yamamoto Causality Test
JEL Classifications: H56; H50; C22

1. INTRODUCTION

According to Maslow's hierarchy of needs, defense is considered one of the most crucial human needs. Additionally, the defense service is recognized as one of the vital responsibilities of public authority, with an economic dimension referred to as military expenditure. Given that military expenditure constitutes one of the primary priorities for nations, regardless of their developmental stage, evaluating its economic and social impacts remains an intriguing area of research. Despite the abundance of literature on the economic consequences of military expenditure, there still exists a divergence of opinions regarding its effectiveness or its potential negative impact on economic growth Azam (2020).

The literature on military expenditures and economic growth can be categorized into three main perspectives. The first perspective, aligned with the military Keynesian school, posits that increased defense spending stimulates demand, boosts purchasing power and overall output, and generates positive external factors (Benoit 1973 and 1978; Baro 1990; Atesoglu 2002; Nordhaus 2002; Faini et al., 1984) This perspective aligns with Keynesian principles, emphasizing the crucial role of government intervention in the economy to bolster aggregate demand and, consequently, spur economic growth. Keynes acknowledged the short-term advantages of military spending but remained doubtful about its long-term social benefits compared to alternative demand management methods Keynes (1937).

In contrast, proponents of the modern classical school view military spending as a fiscal burden on nations, with a detrimental long-term impact on economic growth (Russett 1969; Lim 1983; Deger 1986; Melman 1978; Deger and Sen 1983; Maizels and Nissank, 1986). According to this theory, increased military spending reduces overall resource accumulation available for other domestically significant areas, such as investment in productive capital, education, and healthcare (Smith 1989 and 1977). Military spending, as highlighted by (Russett 1969; Borch and Wallace 2010), tends to decrease productivity. The diversion of funds towards military expenditures forces the government to either raise taxes or borrow from foreign capital markets to balance its budget. The latter choice is fundamentally detrimental to economic development, resulting in increased interest rates, reduced investment and consumer demand, and potentially triggering economic recession. A third viewpoint posits that there is no causal relationship between military expenditure and economic growth (Biswas and Ram 1986; Payne and Ross 1992; Kim 1996; Alexander 1990; and Abdel-Khalek et al., 2019).

(MENA) region is currently experiencing rapid militarization, with almost all countries in the area directly or indirectly involved in regional conflicts. In 2019, the total military expenditure for MENA countries reached approximately 162 billion dollars. Egypt's military expenditure accounted for 2.3% of this total, ranking ninth in the region. Amidst the conflicts and growing threats of terrorism in the region, 12 countries increased their military spending between 2010 and 2019. However, official government data indicate a decrease in real military expenditures in Egypt Kuimova (2020).

Per the SIPRI Military Expenditure Database, Egypt maintains the lowest military burden in the region, with military spending comprising just 1.2% of its GDP. This is evident when comparing military expenditures relative to GDP and their share of total government spending. In 2019, Egypt's military spending stood at 1.2% of GDP, whereas countries like Oman, Saudi Arabia, and Kuwait allocated higher percentages, with figures reaching 8.8%, 8.0%, and 5.6%, respectively.

Official military spending in nominal terms increased significantly, with the 2019/20 budget being 161% higher than that of 2010/11. Despite this apparent growth, high inflation rates, which fluctuated between 6.9% and 24% from 2010 to 2020, significantly eroded the real value of this spending. According to International Monetary Fund (2024), the inflation-adjusted figures reveal that after 3 years of real increases from 2012 to 2013, there were five consecutive years of real decline starting in 2015/16. This decline, coupled with the devaluation of the Egyptian pound, led to an 18% reduction in real terms over the 9 years, as the cost of military resources and services increased relative to the US dollar (Kuimova 2020).

Despite Egypt's regional challenges, a strong military is vital for national security. Yet, the impact of military spending on economic growth is debated. This link affects resource allocation and development strategies, making it crucial for policymakers and economists to understand. Exploring this connection in Egypt is essential for informed decision-making.

The study comprises five sections: Introduction, Literature Review, Data and Methodology, Empirical Results and Discussion, and Conclusion with Policy Implications.

2. LITERATURE REVIEW

2.1. Theoretical Background

The literature on military spending and economic growth can be divided into two main approaches: The Keynesian school and the New Classical approach. The Keynesian school posits that increases in government spending generally boost investments and economic growth through the multiplier effect. Keynes (1937) argued that market economies cannot achieve full employment on their own, so government spending stimulates total demand, influencing income and output levels. Barro (1990) supported this view, suggesting that government spending affects the production function through the hypothesis of internal growth. In contrast, Wagner (1958) emphasized government spending as an internal variable that grows alongside other economic variables. Wagner's Law posits that government spending results from economic growth, asserting a unidirectional causal relationship where economic growth drives government expenditure.

The Keynesian perspective evolved into "military Keynesianism," which posits that military spending stimulates aggregate demand, employment, and investment (Nordhaus, 2002; Atesoglu, 2002). Rooted in Keynesian expenditure theory, military Keynesianism highlights how military expenditures can drive economic growth through supply-side effects. Increased military spending generates a substantial multiplier effect by boosting the utilization of productive capacities, leading to higher production levels. This, in turn, raises capital profits, investments, and overall economic growth (Looney, 1991).

In the 1970s, Emile Benoit's studies indicated a positive correlation between military spending and economic growth in developing countries, aligning with military Keynesian theory. He observed that nations with higher defense budgets tend to experience faster economic growth than those with lower military expenditures. Military spending also benefits civilian economies by funding education, healthcare, and vocational training. Moreover, it supports infrastructure projects such as dams, airports, and communication networks. Additionally, military forces often engage in research and development activities that can complement civilian efforts.

Faini et al. (1984) argue that, according to Keynesian theory, military expenditure is a form of government consumption that stimulates economic growth by increasing demand for goods and services. They suggest that military spending affects economic growth through various channels. For example, higher military spending can lead to greater utilization of productive capacities, higher profits, and increased overall investment and production. This effect is especially significant when total demand falls short of expected supply. Numerous studies support the Keynesian view and the "Benoit hypothesis," highlighting the positive impact of military spending on economic growth (Atesoglu, 2002; Malizard, 2010; Yildirim et al., 2005; Farzanegan, 2014; Khalid and Noor, 2015; Raifu and Aminu, 2023; Lai et al., 2002).

In contrast, the New Classical approach opposes the Keynesian military perspective. It posits that military spending reallocates resources from more productive developmental uses to less efficient ones, increasing opportunity costs (Looney, 1991; Lim, 1983; Deger and Smith, 1983; Melman, 1978; Kinsella, 1990). This approach rejects the Keynesian military hypothesis and Benoit's hypothesis. Numerous studies support the New Classical perspective (Dunne, 2012; Gold, 2005; Dunne and Nikolaidou, 2005; Shahbaz and Shabbir, 2012).

In his study on the U.S. economy, Melman (1978) highlighted the negative effects of increased military spending, such as reduced competitiveness, increased bureaucracy, and decreased investment incentives, with negative spillovers from the military sector to the civilian sector. Similarly, Dunne and Vougas (1999) argued that military spending does not contribute positively to economic growth and often has adverse effects, suggesting that disarmament could improve economic performance. Azam (2020) identified two ways high military spending can harm long-term economic growth: It reduces resources for local investments in productive capital, education, and technology, and it exacerbates economic distortions, decreasing resource allocation efficiency.

2.2. Empirical Review

Military spending and economic growth literature gained momentum after the Benoit hypothesis. In his examination of forty-four developing nations spanning the period 1950-1965, Benoit (1978) determined that military expenditure positively influences economic growth. Various studies have consistently sought to empirically validate this relationship, utilizing different methodologies, estimation approaches, and diverse country samples. Additional research, such as Atesoglu's (2002) investigation, has corroborated the Benoit hypothesis, indicating a robust positive correlation between US gross output and military spending from 1947 to 2000. Similarly, Yildirim et al. (2005) observed that military expenditure contributed to the growth of national GDP in Middle Eastern countries from 1989 to 1999. Likewise, Malizard (2010) identified a bilateral causal link between French economic expansion and military spending during the period from 1960 to 1980.

Moreover, Farzanegan's (2014) research affirmed the favorable influence of military outlays on Iran's economic growth from 1959 to 2007. Similarly, Khalid and Noor (2015) established a positive association between military spending and growth across sixty-seven developing nations. Additionally, Borch and Wallace (2010) discovered that states with higher military expenditures were more adept at mitigating economic downturns compared to states with lower spending levels in 49 American states from 1977 to 2004. Feridun et al. (2011) also found long-term equilibrium link between defense spending and growth in North Cyprus, alongside a significant positive causal relationship between military expenditure and growth from 1977 to 2007, aligning with prior research.

Raifu and Aminu's (2023) study in the MENA region during (1981-2019) unveiled a positive correlation between military expenditure and economic growth, consistent with both Keynesian theory and Benoit's hypothesis. Moreover, Su et al. (2020) conducted a thorough analysis suggesting a reciprocal positive causation, highlighting that heightened military spending in China fosters economic growth, and vice versa.

Prior studies have questioned Benoit's theory. Faini et al. (1984) found slower growth in 69 nations from 1952 to 1970 with higher military burdens, indicating a 10% increase in military spending decreased yearly economic growth by 0.13%. Joerding (1986) showed a one-way causal link between economic development and military spending in 57 developing nations from 1962 to 1977, challenging Benoit's notion of defense spending as exogenous. Deger (1986) observed in 50 developing economies from 1965 to 1973 that military spending hindered growth and development, opposing Benoit's theory. Mintz and Stevenson (1995) discovered a significant positive impact of military spending on economic growth in only 10% of 103 nations from 1950 to 1985. Dunne and Vougas (1999) found a negative effect of military burden on growth in South Africa, consistent with Batchelor et al. (2000) conclusion that military spending did not positively impact growth but negatively affected the manufacturing sector.

Abu-Bader and Abu-Qarm (2003) noted that military spending impedes economic growth. Conversely, civilian expenditures positively impact Egypt (1975-1998), Israel (1967-1998), and Syria (1973-1998). Klein (2004) discovered Peru's growth rate was negatively affected by military expenditures (1970-1996). Chang et al. (2011) found harmful growth effects of military spending for low-income countries across 90 nations (1992-2006). Wijeweera and Webb (2011) observed a 1% increase in the military expenditure ratio only boosts real GDP by 0.04% in five South Asian countries, suggesting minimal growth impact from high military spending. Similarly, Shahbaz and Shabbir (2012) identified a one-way negative link from defense expenditures to growth in Pakistan. Caruso and Francesco (2012) uncovered a long-term negative correlation between productivity and military spending in Italy, proposing improved productivity with civilian expenditure reallocation.

Unlike previous studies which have examined this relationship in diverse global contexts, my study focuses specifically on Egypt, considering its unique socio-economic and political landscape. My research aims to Assessing the Validity of the Benoit Hypothesis on the Egyptian Economy, potentially yielding insights that differ from those of previous studies conducted in other regions.

3. DATA DESCRIPTION AND METHODOLOGY

3.1. Data Description

This study aims to assess Benoit's hypothesis within the Egyptian economic framework, utilizing the same key variables outlined by Benoit: GDP growth (GDPG), military expenditure as a percentage of GDP (MILEX), net official development assistance as a percentage of GNI (NETODA), and gross capital formation as a percentage of GDP (GCF). The analysis covers the timeframe from 1970 to 2022. Data is sourced from the World Bank database and Stockholm International Peace Research Institute (SIPRI) Yearbook for military expenditure.

3.2. Variance Inflation Vector Test

VIF test was performed to detect multicollinearity. It's important to note that a VIF value exceeding 10 suggests multicollinearity, warranting consideration for exclusion (Alin, 2010). Table 1

Table 1: VIF test

Variable	VIF
MILEX	1.777708
NETODA	2.094912
GCF	1.245147
C	NA

illustrates that all VIF values remain below 10, indicating no multicollinearity.

3.3. Unit Root Test

Unit root tests are vital for assessing the stationarity of time series data. Tests like the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) are crucial in identifying unit roots, indicating non-stationarity, or confirming stationarity. The Dickey-Fuller test, first introduced in 1979 and later extended to the Augmented Dickey-Fuller (ADF) test, is expressed in Equation (1) (Mushtaq, 2011)

$$\Delta yt = \rho yt-1+\alpha+\beta t+\gamma 1\Delta yt\text{-}1+\gamma 2\Delta yt\text{-}2+\ldots+\gamma\rho\Delta yt\text{-}p+\varepsilon_t \quad (1)$$

The ADF test uses the tau statistic, created through Monte Carlo simulation, instead of the t statistic, and its hypotheses are as follows:

H0: $\delta = 0$ (The time series contains a unit root and is therefore non-stationary)

H1: $\delta < 0$ (The time series is stationary and does not contain a unit root).

Table 2 indicates that the time series for the variable MIL is stationary at the 1% significance level, implying stability in its level. On the other hand, GCF, NETODA, and GDPG are non-stationary at the level but become stationary after taking the first difference for each at the 1% significance level.

3.4. Model Estimation

The selection of an appropriate model for estimation is considered one of the most crucial and sensitive steps in the estimation process. It should be carefully and accurately determined based on agreed-upon conditions and criteria, with one of the most important being the integration degree of the time series for the variables under study. Therefore, using the Autoregressive Distributed Lag (ARDL) model with distributed lag periods may be the most suitable model according to the nature and integration degree of the variables and in consistency with the study's dynamics. The reasons for choosing this model can be summarized as follows:

a. Differences in the integration degree of the time series for the variables under study, as we have clarified earlier, reveal the presence of some variables at level I(0) (MILEX), in addition to some variables after taking the first difference I(1) (GDPD, GCF, NETODA). Therefore, it is preferable to use the Autoregressive Distributed Lag (ARDL) model or the Bounds Testing approach for testing cointegration.
b. The model's ability to distinguish between the long-term and short-term effects allows for identifying the cointegrating relationship between the explanatory and dependent variables over both time horizons in a single equation. This facilitates the estimation and interpretation of results, along with determining the strength of the impact each explanatory variable has on the dependent variable.

Table 2: Unit root test

Variables	Level	Probability	T-static
GDPG	At level	0.1397	−1.43397
	First difference	0.0000***	−10.3739
GCF	At level	0.5668	−0.31602
	First difference	0.0003***	−7.1307
MILEX	At level	0.0005***	−3.6519
	First difference	-	-
NETODA	At level	0.155	−1.3754
	First difference	0.001***	−5.3913

***represent significance levels 1%, Lag orders in tests are automatically selected based on the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC)
Source: Computed by the authors

c. The model's capability to vary the length of lag periods for the included variables is noteworthy. By considering a sufficient number of time lags for each variable individually, the model obtains an optimal set of data, resulting in the best possible parameter estimations for both long-term and short-term horizons. The determination of the optimal lag length is based on minimizing various lag selection criteria.

3.4.1. ARDL framework

- Select optimal lag:

Table 3 displays the lag length selection process, where the optimal number of lags (3) is determined using the Akaike Information Criterion (AIC).

To determine the optimal lag length for resolving the issue of autocorrelation in the residuals, (AIC) suggests that the ideal number is (1, 3, 2, 4), as illustrated in the following Table 4:

The results from the regression equation test presented in Table 4 highlight the relative quality of the estimated statistical model. This is evidenced by the relatively high adjusted coefficient of determination (R^2 = 76.7%), indicating that the model explains approximately 76.7% of the changes in GDP growth and suggesting that the results are not spurious. Furthermore, the Durbin-Watson statistic (DW = 2.065) being greater than the coefficient of determination R^2 indicates no significant autocorrelation. Additionally, the F-statistic suggests the model's significance at a level below 5%, supporting its reliability for economic analysis.

- Cointegration Tests

To investigate the cointegration relationship between the study variables, Pesaran et al. (2001) method can be utilized. This method assesses the attainment of equilibrium among variables within an Error Correction Model (ECM), known as the Bounds Test Approach As per this methodology; the model is structured as follows:

$$\begin{aligned}\Delta GDP_t = {} & \alpha_0 + \sum \propto_1 \Delta GDPG_{t-i} + \sum \propto_2 \Delta MILEX_{t-i} \\ & + \sum \propto_3 \Delta NETODA_{t-i} + \sum \propto_4 \Delta GCF_{t-i} + \varphi ECT_{t-1} \\ & + \beta_1 GDPG_{t-1} + \beta_2 MILEX_{t-1} + \beta_3 NETODA_{t-1} \\ & + \beta_4 GCF_{t-1} + \varepsilon_t \qquad (2)\end{aligned}$$

Table 3: Lag length selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−513.8741	NA	17787.20	21.13772	21.29215	21.19631
1	−377.0311	245.7590	128.5982	16.20535	16.97752*	16.49831
2	−360.4826	27.01800	127.5259	16.18296	17.57287	16.71029
3	−321.7320	56.93953*	52.18910*	15.25437*	17.26202	16.01607*

Table 4: ARDL model estimation results

Dependent Variable: GDPG				
Method: ARDL				
Sample (adjusted): 1975 2022				
Selected Model: ARDL (1, 3, 2, 4)				
Variable	Coefficient	SE	t-statistic	Prob.*
GDPG(-1)	−0.157626	0.137012	−1.150452	0.2580
MILEX	0.748578	0.468111	1.599146	0.1190
MILEX(-1)	−0.429947	0.677053	−0.635027	0.5297
MILEX(-2)	0.629026	0.486663	1.292530	0.2049
MILEX(-3)	−1.070373	0.362886	−2.949614	0.0057
NETODA	0.106569	0.118953	0.895895	0.3766
NETODA(-1)	−0.306974	0.150728	−2.036607	0.0495
NETODA(-2)	0.480396	0.125109	3.839813	0.0005
GCF	0.341063	0.117495	2.902793	0.0065
GCF(-1)	0.230724	0.107151	2.153255	0.0385
GCF(-2)	−0.152302	0.134899	−1.129003	0.2668
GCF(-3)	0.117215	0.111861	1.047859	0.3021
GCF(-4)	−0.426999	0.109153	−3.911946	0.0004
C	3.475122	0.998306	3.481020	0.0014
R-squared	0.767062	Mean dependent var		5.362785
Adjusted R-squared	0.677997	S.D. dependent var		2.428932
S.E. of regression	1.378304	Akaike info criterion		3.718078
Sum squared resid	64.59055	Schwarz criterion		4.263845
Log likelihood	−75.23386	Hannan-Quinn criter		3.924324
F-statistic	8.612427	Durbin-Watson stat		2.065522
Prob (F-statistic)	0.000000			

Source: Author's estimation

- Δ: First Difference; $\propto_0$: Intercept; $\propto_{6:}$ $\propto_1$: Short term parameters; β_6: β_1: Long term parameters; ϕ: Error correction Term; ε_t: Residual.

To ascertain whether there is a common cointegration relationship among the study variables, the Enhanced Bounds Test for cointegration is employed. This includes the overall F-bound test.

- Overall F-Bounds Test:

Table 5, summarizes the F-Bounds test outcomes, including the F-statistic, critical values, and their interpretation. The F-Statistic Overall test evaluates common cointegration among the study variables, implying a long-term equilibrium relationship. The null hypothesis (H0) suggests no common cointegration, while the alternative hypothesis (H1) posits its existence. The calculated F-Statistic value of 16.5367 exceeds the critical bounds for I(1) at all significance levels. Specifically, at the 1% significance level, the critical bound of 3.65 is surpassed by the calculated F-Statistic, leading to the rejection of the null hypothesis and providing strong support for a common cointegration relationship among the model variables.

- Results of autoregressive distributed lagged long run and short run:

Table 5: Bounds test results

F-bounds test		Null Hypothesis: No levels relationship		
Test statistic	Value	Signif. (%)	I (0)	I (1)
F-statistic	16.53670	10	2.37	3.2
k	3	5	2.79	3.67
		2.5	3.15	4.08
		1	3.65	4.66

Source: Computed by the authors

In the short run, the ARDL analysis in Table 6 highlights significant effects of the variables on economic growth. A one-unit increase in military expenditure (D(MILEX)) is linked to a substantial and statistically significant rise in economic growth (D(GDPG)) by 0.75%. Additionally, a short-term increase in net official development assistance (D(NETODA)) positively impacts economic growth by 0.11%, albeit lacking statistical significance. Moreover, gross capital formation (D(GCF)) positively influences economic growth by 0.34% in the short run, demonstrating statistical significance. Furthermore, the presence of an error correction mechanism is indicated by the CointEq(-1) term, with a coefficient of −1.157626. This coefficient signifies the speed of adjustment towards equilibrium after a shock, aligning with the concept of cointegration. The negative value indicates a rapid error correction mechanism, reinforcing the model's short-term dynamics. The numerical value (−1.157626) suggests that the economic system takes approximately 0.863 years (1/1.157626 = 0.863) to return to equilibrium. This swift correction period aligns with economic expectations, where a higher error correction coefficient corresponds to a shorter correction time and vice versa.

Transitioning to the long run, as illustrated in Table 6, the ARDL model indicates a nuanced impact of the variables on economic growth. Military expenditure (MILEX) exhibits a negative long-term effect on economic growth (GDPG) with a coefficient of −0.1060, though statistically insignificant. Conversely, a one-unit increase in net official development assistance (NETODA) leads to a positive and statistically significant impact on economic growth by 0.24%. (GCF) positively influences economic growth by 0.09% in the long run, approaching statistical significance.

3.5. Causality Test Using the Toda-Yamamoto Methodology

The study employed the Toda-Yamamoto causality analysis proposed by Toda and Yamamoto (1995). This method follows an asymptotic Chi-square distribution with k degrees of freedom, irrespective of series stationarity or cointegration. It bypasses biased pre-tests, ensuring more reliable outcomes. The analysis involves two steps outlined in equations 3 and 4: Determining lag length (k) using a VAR model and integrating the maximum degree of integration (dmax). Initially, a VAR model is established

Table 6: Summary of ARDL model results

Variable	Coefficient (Short run)	P-value (Short run)	Coefficient (Long run)	P-value (Long run)
D (MILEX)	0.7486*	0.0330	−0.1060	0.5291
D (NETODA)	0.1066	0.2713	0.2419*	0.0146
D (GCF)	0.3411*	0.0006	0.0948	0.0790
CointEq(-1)	−1.1576*	0.0000	-	-
R-squared	0.790	-	-	-
Adjusted R-squared	0.7402	-	-	-
S.E. of regression	1.3037	-	-	-
Akaike info criterion	3.5514	-	-	-
Durbin-watson stat	2.0655	-	-	-
MILEX (Levels equation)	−0.1060*	0.5291	-	0.5291
NETODA (Levels equation)	0.2419*	0.0146	0.2419	0.0146
GCF (Levels equation)	0.0948*	0.0790	0.0948	0.0790
C (Levels equation)	3.0019*	0.0016	-	-

Source: Computed by authors

with optimal lag length and dmax determined via unit root tests. Subsequently, prediction is conducted with a size of (k+dmax). Mutual causality is examined using modified WALD test statistics, with hypotheses rejected if the calculated value exceeds the table value with k degrees of freedom (Yoka et al., 2023).

$$Y_t = \delta_1 \sum_{i=1}^{K+dmax} \alpha_{1i} Y_{t-i} + \sum_{j=1}^{k+dmax} \beta_{1j} X_t + \epsilon_{1t} \quad (3)$$

$$X_t = \delta_2 \sum_{i=1}^{K+dmax} \alpha_{2i} Yx_{t-i} + \sum_{j=1}^{k+dmax} \beta_{2j} Y_{t-j} + \epsilon_{2t} \quad (4)$$

H0: No causality exists from Y to X.
H1: There is causality from Y to X.

The test findings in Table 7 for GDPG reveal that MILEX does not Granger-cause GDPG. The Chi-squared value is 2.469806 with 4 degrees of freedom, yielding a probability of 0.6501. Since this probability exceeds the standard significance level (e.g., 0.05), we retain the null hypothesis that MILEX does not Granger-cause GDPG. However, for MILEX, the test outcomes indicate that GDPG does Granger-cause MILEX. The Chi-squared value is 11.95276 with 4 degrees of freedom, resulting in a probability of 0.0177. As this probability falls below the usual significance level, we reject the null hypothesis that GDPG does not Granger-cause MILEX.

3.6. Diagnostics Tests

After researching and analyzing both long-term and short-term relationships, it's crucial to perform diagnostic tests. These tests serve to validate the predictability of the model and uncover any potential flaws that could undermine the reliability of its results.

3.6.1. Autocorrelation

A crucial aspect to examine, pertains to the existence of a correlation between the residuals. This implies a relationship between the residuals in a particular period and their own values in preceding periods. Detecting autocorrelation involves employing diverse methods, such as:

Table 7: VAR granger causality/block exogeneity wald tests

Dependent variable: GDPG			
Excluded	**Chi-square**	**df**	**Prob.**
MILEX	2.469806	4	0.6501
All	2.469806	4	0.6501
Dependent variable: MILEX			
GDPG	**11.95276**	**4**	**0.0177**
All	11.95276	4	0.0177

- Breusch-Godfrey Serial Correlation LM Test

The calculated values for both statistics, specifically 0.6495 for the F-statistic and 0.5280 for the Chi-square, surpass the selected significance threshold. As a result, there is inadequate evidence to refute the null hypothesis, suggesting that the residuals lack serial correlation. Additional details regarding the test outcomes can be found in Table 8.

3.6.2. Autoregressive conditional heteroskedasticity

The ARCH test, designed to assess the hypothesis of constant variance in residuals, produced non-significant statistical probabilities (P-values) for both the F-statistic and Chi-square at the 5% significance level. The computed values for the F-statistic (0.181834) and Chi-square (0.6718) surpassed the chosen significance threshold, indicating insufficient evidence to reject the null hypothesis. Therefore, the results suggest that the residuals' variance remains constant, as outlined in the provided Table 9.

3.6.3. Normality distribution

The Jarque-Bera test, used to check the normality of residuals, showed a non-significant P-value of 0.587830 at the 5% significance level. This means there isn't enough evidence to reject the null hypothesis, suggesting the residuals follow a normal distribution. Figure 1 supports this normal distribution of residuals.

3.6.4. Stability of the short-run model (CUSUM and CUSUM-squared tests)

Stability tests, using cumulative sums of residuals and their squares, are crucial for detecting structural changes and ensuring consistency between long-term and short-term model parameters.

Figure 1: Residuals distribution normality plot

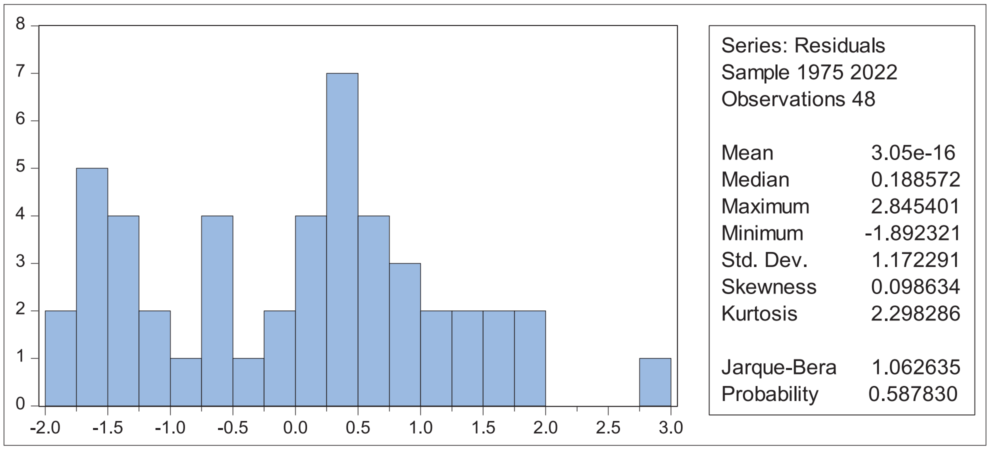


Table 8: Breusch-Godfrey serial correlation LM test

F-statistic	0.437384	Prob. F (2,32)	0.6495
Obs*R-squared	1.277237	Prob. Chi-square (2)	0.5280

Table 9: ARCH heteroskedasticity test results

F-statistic	0.181834	Prob. F (1,45)	0.6718
Obs*R-squared	0.189152	Prob. Chi-square (1)	0.6636

At a 5% significance level, the tests confirm the model's stability over time. Figure 2 demonstrate the alignment between long-term and short-term results.

3.6.5. Forecasting test

The model's predictive capability is affirmed by observing Figure 3, where the GDP growth line falls within the critical region, signifying its reliability for forecasting future growth. This is further supported by statistics such as the Thiel Inequality Coefficient (0.102692) and the Bias Proportion (0.000046), both approaching zero. These values underscore the model's effectiveness in predicting future growth.

4. RESULTS AND DISCUSSION

Throughout this research, a comprehensive analysis of the validity of the Benoit hypothesis on the Egyptian economy was conducted, utilizing the same key variables outlined by Benoit, employing various tools and standard tests. Firstly, the ARDL model was utilized to estimate the short- and long-term effects, additionally; causality tests using the Toda-Yamamoto method were conducted to discern the direction of causality between military spending and economic growth.

The results in Table 6 indicate a non-significant negative relationship between economic growth and military expenditure in the long run. This result challenges the Benoit hypothesis. It implies that military spending is detrimental to economic growth, as argued in the neoclassical model. The neoclassical model suggests that an increase in military spending shifts resources from the private sector at the cost of private spending. This crowds out investment in both the public and private sectors, leading to a decline in the pace of economic growth.

This can be explained through several interpretations. Extensive military expenditure may burden the state with a heavy economic load, reducing resources allocated for investment in infrastructure and economic development. The costs of military conflicts and armaments can negatively impact the economy, redirecting resources from civil projects to military matters, potentially weakening long-term economic growth. Moreover, military tensions can lead to economic instability and deter investors, discouraging further investment in the market. Additionally, a significant allocation of resources to the military may result in debt accumulation and additional economic pressures, hindering economic growth. Excessive focus on military aspects may reduce opportunities for long-term economic growth. These results are contradictory with the findings of Atesoglu (2002), Malizard (2010), Yildirim et al. (2005), Farzanegan (2014), Khalid and Noor (2015), Raifu and Aminu (2023), Lai et al. (2002). While the findings of this study are in accordance with Abu-Bader and Abu-Qarm (2003), Klein (2004), Shahbaz and Shabbir (2012), Azam (2020), Chang et al. (2011).

While there is a significant positive relationship in the short run between economic growth and military expenditure, this aligns with the hypothesis of Benua, supported by studies such as Atesoglu (2002), Farzanegan (2014), Raifu and Aminu (2023), and Khalid and Noor (2015). Benoit suggests that an increase in military spending stimulates overall demand in the economy, contributing to increased production and employment in related sectors. Additionally, it strengthens defense industries by promoting technological innovation, thereby enhancing economic progress through technology transfer to other sectors. Military spending also contributes to increased government investments in infrastructure projects and innovation. Furthermore, military expenditure plays a role in enhancing security and stability, creating a positive environment for investment and economic growth. While these factors may lead to a robust statistical correlation between economic growth and military expenditure in the short term, it's essential to recognize that this correlation doesn't necessarily translate to sustainable development or optimal long-term economic outcomes.

However, it is noteworthy that the results of our study contradict the findings of a study conducted by Maher and Zhao (2021)

Figure 2: Plots of the CUSUM and CUSUMSQ of the recursive residuals

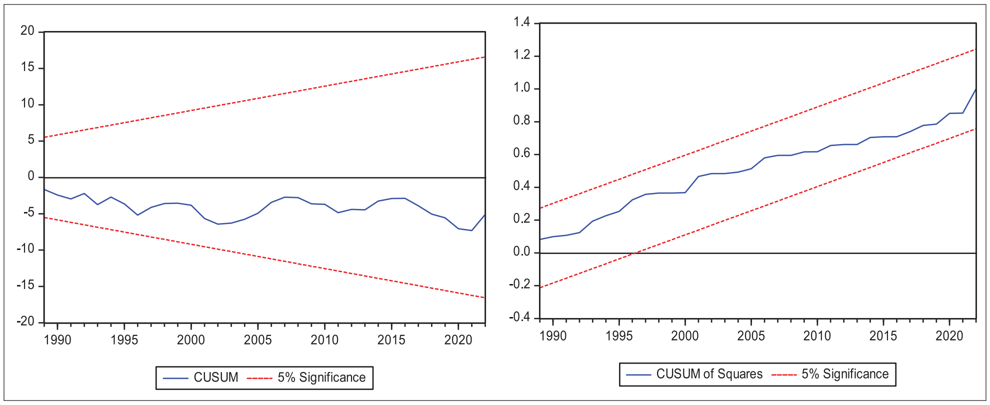
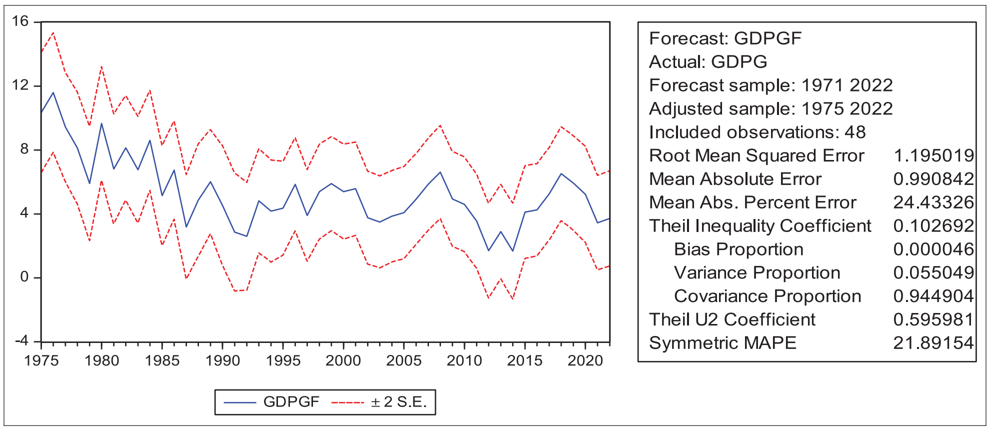


Figure 3: Results of forecasting accuracy test for the estimated model



where his research concluded that there is a significant negative relationship between military expenditure and economic growth in the short run.

The Toda-Yamamoto causality test results (Table 7) provide a detailed view of the link between economic growth and military spending. The test reveals a causal relationship where economic growth influences military expenditure, suggesting that as economies grow, governments may increase military funding. However, the reverse—that military spending drives economic growth—does not hold in the long run. This finding challenges Benoit's hypothesis and Keynesian theory, indicating that defense spending is not an exogenous variable, and aligns more with Wagner's law. Previous studies have shown mixed results; some support these findings (Abu-Bader and Abu-Qarn, 2003; Atuahene et al., 2020), while others (Karagol, 2006; Kollias and Makrydakis, 1997) report different outcomes.

Several factors contribute to the complex relationship between economic growth and military spending. Key among these is resource allocation: Heavy military spending can reduce investment in other crucial sectors, limiting economic development. Additionally, increased military expenditures may escalate debt, constraining the government's ability to fund other growth-stimulating projects. Inefficient management of military spending can further disrupt economic balance, hindering overall development. While economic growth can lead to higher military spending, the reverse effect is less clear and may take time to become evident. There is also a significant positive relationship between net foreign aid and economic growth in the long run as shown in Table 7. This aligns with the hypothesis of Benoit.

5. CONCLUSION AND POLICY IMPLICATION

To assess the impact of military expenditure on economic growth in Egypt, this study used key variables defined by Benoit (1973, 1978). The analysis covers the period from 1970 to 2022, focusing on GDP growth (GDPG), military expenditure as a percentage of GDP (MILEX), net official development assistance as a percentage of GNI (NETODA), and gross capital formation as a percentage of GDP (GCF). For model selection, the study used (ARDL) model to accommodate different integration levels of the variables, allowing for both short-term and long-term estimation. Cointegration tests were then conducted using the Bounds test approach by Pesaran et al. (2001). The Enhanced bounds test, including the Overall F-BOUNDS test, was employed to determine if there is a common cointegration relationship among the variables. To further enhance the robustness of the analysis, this study incorporated the Toda-Yamamoto causality test, a valuable tool in examining the directional causality between the key variables.

The investigation into the Benoit hypothesis within the Egyptian economy reveals complex insights. The long-term inverse relationship between military expenditure and economic growth challenges the expectations set by the Benoit hypothesis. However, the short-term positive correlation adds complexity, highlighting the need for a nuanced understanding of temporal dynamics. The study emphasizes the critical role of capital accumulation in economic growth, suggesting that policies promoting domestic savings and investments are crucial for long-term development. Additionally, the positive impact of international aid on long-term growth underscores the benefits of strategic external assistance for development initiatives. Efficient utilization of military expenditures is also essential, including minimizing wastage, ensuring transparency, and aligning investments with national development goals.

By investigating these relationships, we believe that our study and its findings could help policymakers for adopt a strategic approach to military expenditure, considering a reallocation of resources towards sectors that contribute more directly to long-term economic growth. This may involve optimizing defense budgets to ensure national security without compromising economic sustainability. Considering the long-term negative relationship between military expenditure and economic growth, policymakers are encouraged to engage in strategic planning. This involves assessing the potential economic impacts of sustained or increased military spending over an extended period.

Given the positive relation between economic growth and gross capital formation, Encouraging capital accumulation through policies like tax incentives for savings and investment is vital for sustained economic growth. Governments should prioritize investment in key sectors such as infrastructure and technology to drive long-term economic development. Efficient allocation of international aid to impactful projects and collaboration with international partners are essential strategies for maximizing economic resilience. By implementing these measures, governments can enhance their capacity to undertake impactful projects, ultimately bolstering economic resilience.

The study's findings significantly contribute to the ongoing academic discourse on the Egyptian economy. The nuanced understanding of relationships adds depth to scholarly conversations, opening avenues for further research and analysis.

REFERENCES

Abdel-Khalek, G., Mazloum, M.G., El Zeiny, M.R.M. (2019), Military expenditure and economic growth: The case of India. Review of Economics and Political Science, 5(2), 116-135.

Abu-Bader, S., Abu-Qarn, A.S. (2003), Government expenditures, military spending and economic growth: Causality evidence from Egypt, Israel, and Syria. Journal of Policy Modeling, 25(6-7), 567-583.

Alexander, W.R.J. (1990), The impact of defence spending on economic growth: A multi-sectoral approach to defence spending and economic growth with evidence from developed economies. Defence and Peace Economics, 2(1), 39-55.

Alin, A. (2010), Multicollinearity. Wiley interdisciplinary reviews: Computational statistics, 2(3), 370-374.

Atesoglu, H.S. (2002), Defense spending promotes aggregate output in the United States--evidence from Cointegration analysis. Defence and Peace Economics, 13(1), 55-60.

Atuahene, S.A., Yusheng, K., Bentum-Micah, G., Garti, E., Baah, A. (2020), Military expenditure and economic growth in China. International Journal of Finance, Insurance and Risk Management, 10(2), 3-16.

Azam, M. (2020), Does military spending stifle economic growth? The empirical evidence from non-OECD countries. Heliyon, 6(12), e05853.

Barro, R.J. (1990), Government spending in a simple model of endogenous growth. Journal of Political Economy, 98 (5 Part 2), S103-S125.

Batchelor, P., Dunne, J.P., Saal, D.S. (2000), Military spending and economic growth in South Africa. Defence and Peace Economics, 11(4), 553-571.

Benoit, E. (1973), Defense and Economic Growth in Developing Countries. Lexington, Mass: Lexington Books. Available from: https://lccn.loc.gov/72011848

Benoit, E. (1978), Growth and defense in developing countries. Economic Development and Cultural Change, 26(2), 271-280.

Biswas, B., Ram, R. (1986), Military expenditures and economic growth in less developed countries: An augmented model and further evidence. Economic Development and Cultural Change, 34(2), 361-372.

Borch, C., Wallace, M. (2010), Military spending and economic well-being in the American states: The post-Vietnam war era. Social Forces, 88(4), 1727-1752.

Caruso, R., Francesco, A. (2012), Country survey: Military expenditure and its impact on productivity in Italy, 1988-2008. Defence and Peace Economics, 23(5), 471-484.

Chang, H.C., Huang, B.N., Yang, C.W. (2011), Military expenditure and economic growth across different groups: A dynamic panel Granger-causality approach. Economic Modelling, 28(6), 2416-2423.

Deger, S. (1986), Economic development and defense expenditure. Economic Development and Cultural Change, 35(1), 179-196.

Deger, S., Sen, S. (1983), Military expenditure, spin-off and economic development. Journal of Development Economics, 13(1-2), 67-83.

Dunne, J.P. (2012), Military spending, growth, development and conflict. Defence and Peace Economics, 23(6), 549-557.

Dunne, J.P., Nikolaidou, E. (2005), Military spending and economic growth in Greece, Portugal and Spain. Frontiers in Finance and Economics, 2(1), 1-17.

Dunne, P., Vougas, D. (1999), Military spending and economic growth in South Africa: A causal analysis. Journal of Conflict Resolution, 43(4), 521-537.

Faini, R., Annez, P., Taylor, L. (1984), Defense spending, economic structure, and growth: Evidence among countries and over time. Economic Development and Cultural Change, 32(3), 487-498.

Farzanegan, M.R. (2014), Military spending and economic growth: The case of Iran. Defence and Peace Economics, 25(3), 247-269.

Feridun, M., Sawhney, B., Shahbaz, M. (2011), The impact of military spending on economic growth: The case of North Cyprus. Defence and Peace Economics, 22(5), 555-562.

Gold, D. (2005), Does Military Spending Stimulate or Retard Economic Performance? Revisiting an Old Debate. International Affairs Working Paper No 1. Available from: https://www.files.ethz.ch/isn/15193/Gold_2005-01.pdf

International Monetary Fund. (2024), Egypt: Inflation Rate, Average Consumer Prices, IMF Data Mapper. Available from: https://www.imf.org/external/datamapper/pcpipch@weo/egy?zoom=egy&highlight=egy

Joerding, W. (1986), Economic growth and defense spending: Granger causality. Journal of Development Economics, 21(1), 35-40.

Karagol, E. (2006), The relationship between external debt, defence expenditures and GNP revisited: The case of Turkey. Defence and

Peace Economics, 17(1), 47-57.
Keynes, J.M. (1937), The general theory of employment. The Quarterly Journal of Economics, 51(2), 209-223.
Khalid, M.A., Noor, Z.M. (2015), Military expenditure and economic growth in developing countries: Evidence from system GMM estimates. Journal of Emerging Trends in Economics and Management Sciences, 6(1), 31-39.
Kim, H.S. (1996), Trade-offs between military spending, quality of life and economic growth. Comparative Economic Studies, 38, 69-84.
Kinsella, D. (1990), Defence spending and economic performance in the United States: A causal analysis. Defence and Peace Economics, 1(4), 295-309.
Klein, T. (2004), Military expenditure and economic growth: Peru 1970-1996. Defence and Peace Economics, 15(3), 275-288.
Kollias, C., Makrydakis, S. (1997), Is there a Greek-Turkish arms race? Evidence from cointegration and causality tests. Defence and Peace Economics, 8(4), 355-379.
Kuimova, A. (2020), Understanding Egyptian Military Expenditure. SIPRI Background Papers No 25. p1-24. Available from: https://www.sipri.org/sites/default/files/2020-10/bp_2010_egyptian_military_spending_2.pdf [Last accessed on 2024 Feb 05].
Lai, C.C., Shieh, J.Y., Chang, W.Y. (2002), Endogenous growth and defense expenditures: A new explanation of the Benoit hypothesis. Defence and Peace Economics, 13(3), 179-186.
Lim, D. (1983), Another look at growth and defense in less developed countries. Economic Development and Cultural Change, 31(2), 377-384.
Looney, R.E. (1991), The economics of third world defense expenditures: A survey of recent findings on the contrasting patterns of impact and determinants. Journal of Third World Studies, 8(2), 219-241.
Maher, M., Zhao, Y. (2022), Do political instability and military expenditure undermine economic growth in Egypt? Evidence from the ARDL approach. Defence and Peace Economics, 33(8), 956-979.
Maizels, A., Nissanke, M.K. (1986), The determinants of military expenditures in developing countries. World Development, 14(9), 1125-1140.
Malizard, J. (2010), Causality between economic growth and military expenditure: The case of France. Defense and Security Analysis, 26(4), 401-413.
Melman, S. (1978), Inflation and unemployment as products of war economy: The trade union stake in economic conversion and industrial reconstruction. Bulletin of Peace Proposals, 9(4), 359-374.
Mintz, A., Stevenson, R.T. (1995), Defense expenditures, economic growth, and the "peace dividend" a longitudinal analysis of 103 countries. Journal of Conflict Resolution, 39(2), 283-305.
Mushtaq, R. (2011), Augmented Dickey Fuller Test. Available from: https://ssrn.com/abstract=1911068
Nordhaus, W.D. (2002), The Economic Consequences of a War in Iraq. National Bureau of Economic Research Working Paper Series, No. 9361.
Payne, J.E., Ross, K.L. (1992), Defense spending and the macroeconomy. Defence and Peace Economics, 3(2), 161-168.
Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326.
Raifu, I.A., Aminu, A. (2023), The effect of military spending on economic growth in MENA: Evidence from method of moments quantile regression. Future Business Journal, 9(1), 7.
Russett, B.M. (1969), Who pays for defense? 1. American Political Science Review, 63(2), 412-426.
Shahbaz, M., Shabbir, M.S. (2012), Military spending and economic growth in Pakistan: New evidence from rolling window approach. Economic Research-Ekonomska Istraživanja, 25(1), 119-131.
Smith, R.P. (1977), Military expenditure and capitalism. Cambridge Journal of Economics, 1(1), 61-76.
Smith, R.P. (1989), Models of military expenditure. Journal of Applied Econometrics, 4(4), 345-359.
Su, C., Xu, Y., Chang, H.L., Lobont, O.R., Liu, Z. (2020), Dynamic causalities between defense expenditure and economic growth in China: Evidence from rolling Granger causality test. Defence and Peace Economics, 31(5), 565-582.
Wagner, A. (1958), Three extracts on public finance. In: Musgrave, R.A., Peacock, A.T., editors. Classics in the Theory of Public Finance. International Economic Association Series. London: Palgrave Macmillan.
Wijeweera, A., Webb, M.J. (2011), Military spending and economic growth in South Asia: A panel data analysis. Defence and Peace Economics, 22(5), 545-554.
Yildirim, J., Sezgin, S., Öcal, N. (2005), Military expenditure and economic growth in Middle Eastern countries: A dynamic panel data analysis. Defence and Peace Economics, 16(4), 283-295.
Yoka, K., Turan, M.B., Pekel, A., Yoka, O., Pepe, O. (2023), The relationship between the covid-19 pandemic and the stock market indexes of sports clubs: A time series analysis. PONTE Journal, 79(5/1), 17-35.